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SCIENTIFIC NEWS.

A Review of the Charges Against the Paleontological Department of the U. S. Geological Survey, and of the Defence made by Prof. O. C. Marsh.

To the Editor of the *NATURALIST*:—"I am glad that the matter has at last come out. It will clear the atmosphere. The truth will be sifted out from the falsehood, and great good will be accomplished." This was the answer given by Prof. H. F. Osborn, of Princeton, to a *N. Y. Herald* correspondent, when asked for his opinion about the Cope-Marsh controversy. I fully agree with Prof. Osborn in these remarks.

I will now give a short review of the charges made against Professor Marsh, and of his defence, based on an experience of nearly six years, during which I was an assistant of Prof. Marsh, paid by the U. S. Geological Survey.

1. In the New York *Herald* of January 12th, Prof. E. D. Cope, of the University of Pennsylvania, stated, "The collections made by Prof. Marsh, as the vertebrate palæontologist of the Geological Survey, . . . are all stored at Yale College, with no assured record as to what belongs to the Government and what to the College."

To this Professor Marsh replied that "every specimen belonging to the government is kept by itself, and no mixing with the Yale Museum collections is possible." Prof. H. F. Osborn and Dr. O. Meyer have sustained this fully, and I am glad to say that great care is taken at the Yale Museum in this regard. But this is irrelevant to the question raised by Prof. Cope, for, of course, the labeling is entirely in the hands of Prof. Marsh, without any control from the Geological Survey. In this connection there is one thing that I can not quite understand; how it is that the splendid specimens of horned dinosaurs became the property of Prof. Marsh, and not of the government. Can Prof. Marsh pay his collectors this month out of his own pocket, and the following out of the pocket of the government?

2. The next statement made in the *Herald* is, that these collections "are locked away from the people, and no one is allowed to see them, not even visiting scientists." This Prof. Marsh admits is in part true.

He says, that "visiting scientists of good moral character are always welcome." Now I may mention, that a scientist of very "good moral

character," well known in this country and in Europe, wanted to see the material of the Dinocerata shortly after the volume on this order had been published. When he arrived at New Haven he was told by Prof. Marsh that he was very sorry not to be able to show him the material, since it had been boxed up lately and was inaccessible. The fact is, that the whole material was spread on a large table in the room where the conversation took place. By the order of the professor the fossils had been covered up with cloth the day before.

3. The next charge of Prof. Cope is, that the greater part of Prof. Marsh's published work has been done by his assistants. This is denied by Prof. Marsh emphatically. As it is a very important question, I shall try to solve it as far as I am able to do. I can not speak of the authorship of the work on the Odontornithes from personal knowledge, but from all that I have heard at New Haven it is true that this memoir is mainly the work of the late O. Harger. Mr. G. B. Grinnell, in a letter written to Prof. Marsh and published in the *Herald*, stated that Prof. Marsh dictated to him a part of the description and all the conclusions of the work. This is all true, but the question remains, *From whom did Prof. Marsh receive that which he dictated* to Mr. Grinnell? I think it is now the proper place to speak a little more fully as to the way of using his assistants adopted by Prof. Marsh. The fact is that a great part of the descriptive and general part of most of Prof. Marsh's papers is the work of his assistants. Prof. Marsh asks them questions, the answers of which he either immediately puts down in black and white, or he makes out a list of questions to be worked out by his assistants, for instance: "What are the principal characters of the skull of the Sauropoda?" or, "What are the relations between the different groups of Dinosaurs?" and so on. The assistant, if not yet fully familiar with these questions, begins to work; he goes over the whole literature, a thing rarely done by the Professor, and studies the specimens in the collection. After this is done, the Professor receives the notes of the assistant, or he asks questions, writing down the answers he receives. In this way he accumulates a great quantity of notes, written in his own handwriting, or in that of the assistant. By comparing and using these notes it is easy for him to dictate a paper to any person who can write. This person, of course, when asked, can testify that the work was dictated by Prof. Marsh, without telling a falsehood.

Since I have been named in connection with the work of the Dinocerata, I may state here fully the nature of the assistance I rendered in its preparation. On two Sundays I spent a number of hours at

Prof. Marsh's house, to "go over his conclusions." Questions were asked and answered, new points were brought up by me and adopted, and when it came to the classification of Ungulata, I gave my opinion, which was mainly based on Prof. Cope's work, introducing small changes only. I gave the classification with Prof. Cope's names, as I informed him; but these were all changed by Prof. Marsh. There is no doubt Prof. Marsh had never studied Prof. Cope's papers on this subject, since he not only did not know the names of the orders, but he even asked how to spell them. That the descriptive part of the Dinocerata was mainly the work of Mr. O. Harger, I know. He made both descriptions and measurements of the different bones, which were used by Prof. Marsh when he wrote his text, or dictated it. It may be here a proper place to mention the language used by Prof. S. E. Smith, of Yale University, in an obituary of Mr. Harger, his best friend. "His best work and highest attainments were in the department of vertebrate palæontology. Remarkable logical powers, an unbiased mind, and years of accurate observation, had given him a truly wonderful knowledge of vertebrata osteology. Under his hand the broken and disarranged bones of an unknown carpus or tarsus seemed to fall into their proper places by magic. But his knowledge was not one of details alone; he had a truly philosophical grasp of the bearing of facts on evolution and classification, and *only the few who knew his attainments can appreciate how much palæontological science would have been advanced had he been able to publish his observations and conclusions.*" (Italics are mine.) I may mention here, that the statements of Dr. O. Meyer in regard to the Batrachia and Mammals from the Jurassic, and the oldest "bird" *Laopteryx*, are true.

Now let us consider some papers of Prof. Marsh which were doubtless written by himself. There is one on the Cretaceous Mammals. In this paper several times over three or four genera are made out of three or four teeth belonging to animals of one genus. Incisor, molar and premolar teeth of the upper and lower jaw are considered to belong to three or four different animals; each representing a new genus. The discovery of Cretaceous mammals in great numbers (only one species was known before, which was found by Dr. J. L. Wortman, Prof. Cope's former assistant) of course was a very interesting fact, and it is certainly this fact which induced Prof. Flower and Prof. Gaudry to write complimentary letters to Prof. Marsh. But the latter discovery is due entirely to Mr. J. B. Hatcher and Dr. C. E. Beecher. The description given by Prof. Marsh of these fragmentary, but highly interesting, fossils is simply ridiculous, and has been already criticised

by Prof. Cope and Mr. Lydekker, of the British Museum. Among other cases of the kind, I may mention only two, of one of which Dr. O. Meyer has already written. In 1877 Prof. Marsh described a new mammal under the name of *Apatodon mirus*, from the Jurassic of the Rocky Mountains, with the following words: "One of the most interesting specimens hitherto found in the Rocky Mountain region, is a portion of a lower jaw with the last molar in place. This fossil is widely different from anything yet described, and its exact affinities are doubtful. The fragment pertained to an animal about as large as a Tapir, and the general appearance of the specimen at once suggests the mammalian type. The tooth most resembles, in form and superior surface of crown, that of a typical suilline. The structure of the tooth, however, is different, and the fangs are, in part at least, coössified with the jaw.

"This specimen was found near a locality where Dinosaur bones were abundant, and it is possible it may belong with that group. The jaw, however, is very unlike any corresponding jaw of a Dinosaur, so far as now known. The geological horizon is Lower Cretaceous or Jurassic."

This was certainly a most interesting discovery. A mammal as big as a Tapir, from a Jurassic or Cretaceous formation, from which only very small Marsupial-like mammals were known, a mammal with teeth like a typical suilline from such an old formation, a mammal with the teeth partially coössified with the jaws, is something startling new! I had the greatest curiosity to see this specimen, and fortunately my curiosity was gratified. The hog-jaw from the Cretaceous or Jurassic was a weathered piece of a Dinosaurian vertebra, from the neural spine, some parts of which looked something like a tooth of a hog. Prof. Marsh knew of this mistake long ago, but he has not found it necessary to correct it. Only in his list of genera printed for private use, this specimen appears as a genus of Dinosaurs.

Another example. In 1884 the palæontological world was aroused by the highly important discovery by Prof. Marsh of a Dinosaur which was said to have the metatarsals united, just as a bird. The metatarsus of this reptile, called *Ceratosaurus* by Prof. Marsh, was figured side by side with the corresponding bone of a penguin, and at the end of the paper the following sentence occurs: "All known adult birds, living and extinct, with possibly the single exception of archeopteryx, have the tarsal bones firmly united, while all the Dinosauria, except *Ceratosaurus* have these bones separable. This exception in each case brings the two classes near together at this point, and

their close affinity has now been clearly demonstrated.” Now a word about this great discovery, which has been already reported in text-books and popular works. The specimen on which the conclusion was based is pathological. The animal when alive had a fracture of the lower part of the metatarsus, but it was happy enough to recover from this accident. The bones coössified, as it generally happens in such cases, at the place where they were broken, but not at any other place. From this pathological specimen Prof. Marsh trumpeted forth to the world one of his greatest discoveries. Prof. Marsh knows very well that this specimen is pathological, but he has never taken back his blunder, notwithstanding that I discussed this matter at different times with him.

4. Another accusation of Prof. Cope against Prof. Marsh is, that he has plagiarized the work of others. This is so well known among scientists that it is hardly necessary to go into this point. But I may give a few examples. Everybody knows that Prof. Huxley’s lectures on the evolution of the horse were written long before Prof. Marsh began to work on the subject. That Kowalevsky published two extensive memoirs on the genealogy of the horse in the year before Marsh, is also a fact.

Prof. Marsh states that he never saw Kowalevsky’s work before his own was completed and partly published. This may be, but it hardly agrees with the fact that one of Kowalevsky’s papers was published in the greatest palæontological journal of to-day, in Prof. V. Zittel’s *Palæontographica*, and the other one in the Memoirs of the St. Petersburg Academy. Prof. Marsh’s invectives against Kowalevsky, the most able palæontologist of Europe, a man admired by Darwin and Huxley, who took his life in an attack of insanity, are outrageous. It shows that Prof. Marsh is not afraid of any means he can use to defend his reputation.

In the same way Prof. Marsh has tried to plagiarize an important discovery by Dr. T. W. Hulke, of London, a president of the Geological Society of this city. Dr. Hulke published in 1875, in the Proceedings of the Geol. Soc. of London, a paper, with figures, in which he expressed some entirely new ideas on the pelvis of birds and reptiles. Dr. Hulke sent a copy of this paper to Prof. Marsh, who, besides, receives regularly the *Geological Journal*. Three years later Prof. Marsh publishes exactly the same results as Dr. Hulke, and he is kind enough to state in a foot note, “After these figures were made, showing the position of the Dinosaurian pubis, which has caused so much discussion since Cuvier, I found that Dr. T. W. Hulke had already suggested

the true solution of one difficulty (*Journal Geol. Soc. of Lond.*, Vol. XXXII., p. 334).'' The year 1875 is wisely left off, and the statement that Dr. Hulke suggested the solution is not true, because he really solved the whole problem in the same manner as Prof. Marsh.

Only a short time ago I had opportunity to observe Prof. Marsh's passion to adorn himself with other's plumes. I have devoted considerable time to the study of the evolution of the skeleton of the ostrich. Among others, I made a discovery which was of especial importance, as it throws new light on the question of the relation between birds and Dinosaurs. I told Prof. Marsh about this discovery, and did not publish it. When Prof. Marsh wrote his paper on *Ornithomimus* he simply claimed the discovery as his own, not mentioning me at all. This I saw when he gave me the proof-sheets of the paper. It was after a discussion of nearly two hours that Prof. Marsh agreed to give me credit for it (in a place where it could be easily overlooked) in the explanation of the figures.

That Prof. Marsh ignores the work of others is a well known fact, which can be seen by everybody who takes the trouble to look over his papers; who will, with extremely rare exceptions, never find any paper cited. There is, it is true, a extensive bibliography appearing as an appendix to the Dinocerata, but this bibliography is not used in the text, and nobody can see from the text what has been done by others on this order.

5. Dr. O. Meyer has made the statement that specimens are restored in a very unscientific way under the direction of Prof. Marsh. This statement I sustain. Plaster of Paris has been used in restorations in a very extensive way, although latterly, I am glad to say, there has been a reduction of the extent of it. I have seen specimens restored with colored plaster, so that it was hard to tell where the bone began and the plaster ended. Such specimens are made nearly useless for exact study, and it will only be possible after the plaster has been removed, and this with great difficulty. Colored plaster has been used especially in restoring bones of Sauropoda, Stegosauridæ, and Dinocerata. The general effect is that nearly all the specimens of this group look complete. But this artificial embellishment of the specimens has also been transferred to the drawings. Some of the plates of the great volumes which wait for publication contain drawings of complete bones, but which, if examined, consist of a considerable part of plaster. That such plates are unscientific, I do not need to state. I must say, in justice to Prof. Marsh, that for the last five years this method has been stopped, and that now, with very few exceptions, the drawings are

made from the actual specimens, and that the missing parts are shaded in. A very great calamity is, that the specimens are often not drawn as they really appear in nature, but that they are drawn restored. These restorations are made according to the order of the Professor. If it now happens that the restoration should prove to be incorrect, the plate becomes worthless and has no scientific value.

Dr. O. Meyer has stated that Prof. Marsh has antedated his volume on the Dinocerata intentionally. This is also true; and everything that has been said by him about this point is correct. The review of this work was written by Prof. Marsh himself, and he asked the signatures of Mr. Harger and Dr. Williston for it without success, and had to accept instead the initials of the lady type-writer.

7. There is one insinuation made in the article of Dr. Meyer on which I have to say a few words. It refers, if I understand rightly, to the type specimen of *Triglyphus* which has disappeared from the Museum at Stuttgart. Dr. Meyer has asked Prof. Marsh to state how he came in to possession of a tooth from a "Jurassic" (Triassic) mammal from Germany, of which Prof. Marsh told Dr. Meyer. Prof. Marsh has not answered Dr. Meyer's article. In justice to Prof. Marsh, I state that the tooth in the possession of Prof. O. C. Marsh was purchased from a dealer of Stuttgart, in 1865, and that it is not the type of *Triglyphus* which disappeared from the Stuttgart Museum. All the positive statements of Dr. Meyer's article I consider to be true.

8. Prof. Cope thinks "that an investigation as to who has delivered Prof. Marsh's lectures in Yale College during past years will yield some interesting results." To this I have to say, that such an investigation is not necessary; *Prof. Marsh does not lecture at Yale at all.*

9. Prof. W. B. Scott, of Princeton, has published in the *Herald* of January 22d, a letter written by him to Prof. Marsh. What Prof. Scott has said there I fully sustain. He says: "I feel constrained to say that I disapprove of your work, your methods and your administration of the office which you hold. This disapproval does not rest on what I have heard from others, nor upon any personal considerations, but upon my own experience and my studies in the field to which both you and I are devoted. If called upon to testify in any investigation, this is the line to which, however reluctantly, I shall be compelled to adhere."

G. BAUR, Ph.D.